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ABSTRACT

The second-score auction (SSA) model is often used to evaluate the potential competitive effects of a merger or acquisition involving markets in which sellers and buyers set individualized prices for products. This article discusses the interpretation and implementation of efficiencies in the context of the SSA model. The effects of increased competition from efficiencies in the SSA model may be seen both (1) in reduced prices that predominantly benefit buyers that are not otherwise affected by the merger and (2) in certain situations in which buyer welfare increases through higher quality and higher prices. The latter suggests that the assessment of merger outcomes should be based on the change in consumer welfare rather than the change in prices alone.

Le modèle d'enchère de second tour (SSA) est souvent utilisée pour évaluer les effets potentiels sur la concurrence d'une fusion ou d'une acquisition impliquant des marchés sur lesquels les vendeurs et les acheteurs fixent des prix individualisés pour les produits. Cet article traite de l'interprétation et de la mise en œuvre des gains d'efficacité dans le contexte du modèle d'enchère de second tour. Les effets d'une concurrence accrue résultant des gains d'efficacité dans le modèle SSA peuvent se manifester à la fois (1) par des prix réduits qui profitent principalement aux acheteurs qui ne sont pas autrement affectés par la fusion et (2) dans certaines situations où le bien-être de l'acheteur augmente grâce à une meilleure qualité et à des prix plus élevés. Dans ce dernier cas, l'évaluation des résultats de la fusion devrait se fonder sur l'évolution du bien-être des consommateurs plutôt que sur la seule évolution des prix.

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I. Introduction

1. Antitrust agencies and merging parties often use the second-score auction (SSA) model to evaluate the potential effects of a merger or acquisition on competition involving markets in which sellers and buyers set individualized prices for products, such as in industries like health insurance, broadline foodservice distribution, and marine water treatment chemicals.[1] While the analysis in the United States typically focuses on potential adverse price effects, in many of these cases the merging parties argue that efficiencies associated with the transaction will increase the incentive of the merged parties to compete.

2. Nathan Miller proposed a tractable stochastic version of the SSA model to study and calibrate the potential price effects of mergers among suppliers in a procurement context where a firm seeking to buy a product or service receives bids from multiple prospective suppliers and then evaluates contract terms based on both pecuniary and non-pecuniary factors.[2] Procurement auctions are used in many contexts, such as governments issuing a public tender to purchase goods or services, or shippers listing items to transport cross-country and seeking potential carriers. The key intuition of the model is that when suppliers compete through an auction, the transaction price is decided by the second-best alternative. A merger between suppliers will lead them to avoid bidding against each other, and thus will in general worsen the second-best alternative whenever the merging parties would be ranked first and second in the bidding process.

3. An interesting question is whether it is appropriate to apply the SSA model to real-world settings that do not follow this format. For example, procurement auctions may be based on selecting among best-and-final offers—that is, a "first score" auction. Nathan Miller's original article argues that the SSA model approximates to certain bargaining settings in which buyers play sellers off against each other until all but one drop. Miller argued that first-score auctions require commitments to avoid renegotiation that are rare in procurement settings and that generally the economics resemble closely those of consumer product markets with Bertrand pricing. Intermediate settings such as best-and-final offers with limited scope for renegotiation by the winner, bargaining with limited ability to go back-and-forth between sellers, and other real-world settings may not be equivalent to either one of these examples. To evaluate whether the model is a good fit for an Industry, model predictions could be compared to real-world data from the merging parties. The determination of whether it is appropriate to apply insights from the SSA model to a given merger or acquisition should be done on

1 See, e.g., United States of America, et al., v. Anthem, Inc., et al.; Federal Trade Commission, et al. v. Sysco Corporation, et al.; Federal Trade Commission v. Wilhelm Wilhelmsen, et al.; Federal Trade Commission v. Rag-Stiftung, Evonik, et al.; United States of America v. United States Sugar Corporation, et al.; United States of America v. Bertelsmann SE & Co. KGaA, Penguin Random House, LLC, et al.

2 *See* N. H. Miller, Modeling the effects of mergers in procurement, *International Journal of Industrial Organization*, Vol. 37, 2014, pp. 201–208. *See also* N. H. Miller, Modeling the Effects of Mergers in Procurement: Addendum, *Georgetown McDonough School of Business Research Paper* No. 3513510, 2017.

a case-by-case basis. In what follows, we abstract away from this question and assume that the SSA captures the relevant economics of the transaction under study.

4. The SSA model is designed to study a merger of suppliers in a market that is assumed to have many buyers. In the auction, each supplier offers the value of their good or service, and the minimum price at which the supplier is willing to transact. The supplier with the highest score wins the auction and pays a price that makes the buyer's utility equal the score offered by the second-best bid.[3] As discussed in Miller (2014), when the supplier's value and cost cannot be changed, a dominant strategy for suppliers is to bid their marginal cost.

5. Merging suppliers are typically assumed to continue offering the products offered by each standalone supplier.[4] Knowing the value and cost of each product, the merged supplier will have an incentive to submit only one bid—the one with the highest surplus, which is the mechanism through which there can be reduced competition. Again, the dominant strategy is to submit an offer that truthfully reveals the merged supplier's marginal cost.

6. A merger's impact or harm to a buyer is measured by the difference in the buyer's utility. Without efficiencies or changes to the products, the winner of the auction does not change, the value to the buyer from the acquired product does not change, and thus the impact on the buyer's utility is identical to the change in price. The change in price is given by going to the third-best supplier, whenever the best and second-best are the merging suppliers. In this way, a reduction in competition can be seen when the second-best alternative worsens as a result of the merger. On the other hand, efficiencies may improve the second-best alternative under certain circumstances, which we explore in detail in this article.

7. Although the legal status of the role and importance of efficiencies in merger review is far from settled,[5] from an economic standpoint it is clear that changes in the merging parties' cost structure—which we will call "efficiencies"—affect the incentives of the merged parties to compete and as such factor into the economic analysis of mergers and acquisitions.[6] We see a gap in the technical literature when it comes to the analysis of efficiencies in contexts that are modeled as SSAs: while practitioners often incorporate efficiencies into this setting, to our knowledge there is no publication that describes the interpretation and implementation of efficiencies in the context of SSAs. This article aims to fill this gap by outlining the implementation of efficiencies in this context. In doing so, this article will illustrate the interpretation of efficiencies in the SSA that may apply more generally in settings in which prices are set on an individual basis.[7] While an analysis of efficiencies in settings involving posted prices focuses on parties' own incentives to change their own posted prices, in settings where prices are set on an individual basis, such as SSAs, efficiencies may disproportionately impact the pricing of products sold by non-merging parties.

8. The article is organized as follows: Section II discusses the implementation and incidence of efficiencies within the SSA framework. Section III provides considerations for the efficiencies defense through the lens of the SSA. Section IV provides a conclusion.

II. Efficiencies in the SSA model

9. A primary benefit of mergers to the economy is their potential to generate significant efficiencies and enhance the merged supplier's ability and incentive to compete, as recognized in Oliver Williamson's seminal 1968 paper[8] and captured in the 2010 Horizontal Merger Guidelines in the United States[9] and the 2004 European Merger Regulation.[10] When firms post prices for their products, marginal costs are a direct input into price setting and reductions in marginal costs are typically passed on as reductions in prices.[11]

10. Unlike in the posted price setting, in the SSA model (and in certain other settings in which prices are set individually), the merging suppliers do not directly set the transaction price.[12] Nonetheless, changes in marginal costs will change suppliers' offers in auctions and can therefore change outcomes including the transaction price. Notably, reductions in marginal costs improve the merged supplier's offer. These improved bids can then increase the utility of buyers of goods not sold by the merged supplier. As such, reduced competition from the merger and increased competition from reductions in marginal costs are experienced by distinct groups of buyers. This aspect differs from the traditional posted

3 We use certain terms in the way they are defined in Miller (2014). A buyer receives utility from a transaction, which is the difference between the value of the good or service and its price. The supplier's profit is the difference between the price and marginal cost. The sum of buyer utility and supplier profit is the surplus created by the transaction. Bids in a second score auction combine the characteristics of the good or service and the minimum price the supplier is willing to receive, and a bid's score is the difference between the value of the good or service and the minimum price quoted by the supplier.

4 It is also possible for them to choose to discontinue a product, but see Waehrer (2021) for a discussion of challenges to the assumption that a good will be discontinued.

5 *See* H. Hovenkamp, Appraising Merger Efficiencies, *Geo. Mason L. Rev.*, Vol. 24, 2017, pp. 703–741.

6 In the United States, cost reductions may not be cognizable if they are not verifiable or merger-specific. The analysis in this article applies to any reduction in costs, and can be adjusted to incorporate only efficiencies that have been deemed legally cognizable.

7 The SSA is one example of such a setting.

8 O. E. Williamson, Economies as an Antitrust Defense: The Welfare Tradeoffs, *The American Economic Review*, Vol. 58, No. 1, 1968, pp. 18–36.

9 U.S. Department of Justice and the Federal Trade Commission, Horizontal Merger Guidelines ("HMG"), 2010, § 10, https://www.justice.gov/atr/horizontal-merger-guidelines-08192010.

10 Council Regulation (EC) No. 139/2004 of 20 January 2004 on the control of concentrations between undertakings, OJ L 24, 29.1.2004, p. 1.

11 For example, the HMG note that "[i]n a unilateral effects context, incremental cost reductions may reduce or reverse any increases in the merged firm's incentive to elevate price" (HMG, § 10).

12 The margin that the winning supplier receives and in turn the transaction price is determined by the difference in the scores associated with the winner and runner up suppliers.

price setting where reduced competition and reductions in marginal costs all affect the final price of the same products—those goods sold by the merging parties.

11. Miller (2014) and Miller (2017) provide closed-form results for the changes in auction outcomes—absent efficiencies—that may occur as a result of a merger when values and costs (and therefore surplus) are stochastic and characterized by the Gumbel distribution, a particular form of distributional assumptions.[13] In this article, we extend these calculations to illustrate the implementation of efficiencies using the closed-form solution obtained under the Gumbel distribution.

1. Closed-form solution with efficiencies

12. Consider a merger between suppliers j and n. Let c_{ij}^{pre} denote the marginal cost before any efficiencies and c_{ij}^{eff} denote the marginal cost after incorporating efficiencies, and consider γ_j and γ_n to be the cost reductions for suppliers j and n such that $\Delta c_{ik} = c_{ik} - c_{ik}^{eff} = \gamma_k > 0$ for $k \in \{j,\ n\}$ and $\Delta c_{ik} = 0$ for $k \notin \{j,\ n\}$. Since the cost reductions allow the merging suppliers to improve their bids and offer greater surplus, γ_j and γ_n can also be interpreted as an increase in the mean supplier-specific surplus δ_j and δ_n, respectively.

13. After incorporating efficiencies, the probability that supplier k wins an auction is given by:

$$s_k^{eff} = \frac{\exp\left(\frac{\delta_k + \gamma_k}{\sigma}\right)}{\sum_{l \in A} \exp\left(\frac{\delta_l + \gamma_l}{\sigma}\right)} = \frac{\exp\left(\ln(s_k) - \ln(s_0) + \frac{\gamma_k}{\sigma}\right)}{\sum_{l \in A} \exp\left(\ln(s_l) - \ln(s_0) + \frac{\gamma_l}{\sigma}\right)} \qquad (1)$$

where $\gamma_k = 0$ for $k \notin \{j,\ n\}$. Note that the cost reductions for the merging suppliers j and n increase the winning probabilities of the merging suppliers and decrease the winning probabilities of other suppliers.

14. The pre-merger shares and cost reductions are available from the data, while δ is recovered based on a supplier's share and margin. After the post-merger shares are calculated from equation (1), post-merger margins can be calculated using the margin equation provided by Miller (2017).[14]

15. Post-merger expected price with efficiencies for supplier k can be calculated as:

$$p_k^{eff} = m_k^{eff} - m_k^{pre} + p_k^{pre} - \Delta c_k. \qquad (2)$$

16. As an example, consider four identical suppliers A–D, each with a share of 25%, a margin of $50,000, and a price of $250,000. Furthermore, consider a merger of Supplier A and Supplier B.

17. Table 1 shows the price effects after the merger between Supplier A and Supplier B under two scenarios. In the first scenario, efficiencies are assumed to be zero. In the second scenario, efficiencies lead to a 5% cost reduction of each merging supplier's cost, equivalent to a cost reduction of $10,000.

18. In the first scenario, in which there are no efficiencies, Supplier A's and Supplier B's prices increase by 4.1%. Other suppliers' prices do not change. In the second scenario, in which there are efficiencies, the cost reductions offset the price effects and Supplier A's and Supplier B's prices increase by 1.4% while other suppliers' prices decrease by 0.4%.

Table 1. Price effects by supplier

	Without Efficiencies	With Efficiencies
Merging Supplier A	4.1%	1.4%
Merging Supplier B	4.1%	1.4%
Supplier C	0.0%	– 0.4%
Supplier D	0.0%	– 0.4%
Average	2.1%	0.6%

19. As noted, the prices of Supplier C and Supplier D decrease because there are auctions won by Supplier C or Supplier D in which one of the merging suppliers is the runner-up. In those auctions, cost reductions as a result of the merger cause the merged supplier to bid at a lower marginal cost, driving down the prices that buyers pay to other suppliers.

20. Although the implementation of efficiencies into the SSA model is quite straightforward under the Gumbel distribution, the underlying incidence of efficiencies is significantly more nuanced. We discuss this in detail in the next section.

2. Incidence of efficiencies

21. In this section we explain the mechanisms through which efficiencies affect competitive outcomes in the SSA model by increasing competition in certain auctions. As with the merger's effect on prices, the effects of efficiencies are not seen in all transactions by the merged supplier. Instead, efficiencies may improve buyer utility (relative to a situation without efficiencies) when they improve the buyer's second-best surplus such that the auction has the same winner but a lower winning price, or when they improve the buyer's surplus such that the merged supplier wins an auction that it previously did not, and the previous winner becomes the runner-up post-merger. Finally, we include for completeness the scenario under which efficiencies do not affect the auction's outcomes.

13 *See* Miller (2014), *supra* note 2. *See also* Miller (2017), *supra* note 2.

14 Specifically, post-merger margins are given by: $m_k^{post} = \begin{cases} \frac{1}{s_k}\sigma \log\frac{1}{1-s_k}, & k \notin \{j,n\} \\ \frac{1}{s_j + s_n}\sigma \log\frac{1}{1-s_j-s_n}, & k \in \{j,n\} \end{cases}$

22. In what follows, we adopt additional notation for ease of exposition. We continue to focus on situations in which suppliers *j* and *n* merge, and we assume without loss of generality that supplier's *j* product has higher surplus both with and without efficiencies. We further denote post-merger surplus with efficiencies by w_{ij}^{eff}. If the supplier with the maximum surplus before the merger is not one of the merging parties, we denote it by z.

2.1 Efficiencies increase buyer utility if the merged supplier is the runner-up before the merger and remains the runner-up after the merger

23. The first case we analyze is when the merged supplier was not the auction winner but had the second-highest surplus before the merger and remains the runner-up after the merger and its associated efficiencies are realized. Under these circumstances, the price goes from

$$p_i^{pre} = v_{iz} - w_{ij} = v_{iz} - (v_{ij} - c_{ij}) \tag{3}$$

to

$$p_i^{post} = v_{iz} - w_{ij}^{eff} = v_{iz} - (v_{ij} - c_{ij}^{eff}) \tag{4}$$

and the change in price is

$$\Delta p_i = c_{ij}^{eff} - c_{ij} = -\Delta c_{ij} < 0 \tag{5}$$

24. Because the auction winner does not change, the value to the buyer does not change, and this reduction in price increases buyer utility one-to-one. In other words, the buyer benefits from the full magnitude of the efficiencies in this case because efficiencies fully increase the merged supplier's surplus, which determines the final utility that accrues to the buyer given that the merged supplier is the runner-up before the merger.

2.2 Efficiencies increase buyer utility if the merged supplier was not the winner or runner-up before the merger and becomes the runner-up after the merger

25. A similar situation occurs if the efficiencies result in the merged supplier becoming the second-highest surplus supplier. Under these circumstances, the price goes from

$$p_i^{pre} = v_{iz} - \max_{k \neq z}\{w_{ik}\} \tag{6}$$

to

$$p_i^{post} = v_{iz} - w_{ij}^{eff} \tag{7}$$

and the change in price is

$$\Delta p_i = \max_{k \neq z}\{w_{ik}\} - w_{ij}^{eff} < 0 \tag{8}$$

26. Using the definition of c_{ij}^{eff}, one can express $w_{ij}^{eff} = w_{ij} + \Delta c_{ij}$, which is another way of saying that the increase in surplus is the same as the reduction in costs due to efficiencies. Thus, the change in price to the buyer becomes

$$\Delta p_i = \max_{k \neq z}\{w_{ik}\} - w_{ij} - \Delta c_{ij} > -\Delta c_{ij} \tag{9}$$

where the inequality follows because before the merger, supplier *j*'s surplus was lower than the second-best surplus, which means $\max_{k \neq z}\{w_{ik}\} - w_{ij} > 0$.

27. In other words, when efficiencies allow the merged supplier to become the second-best option, the reduction in costs is not fully passed on to prices. As with the previous case, the reduction in prices increases buyer utility one-to-one in this case, and so efficiencies increase buyer utility, but by less than the reduction in the merged supplier's cost.

2.3 Efficiencies increase buyer utility if the merged supplier becomes the highest-surplus supplier after the merger

28. We now analyze the case in which efficiencies are sufficient to change the ranking of suppliers such that the merged supplier becomes the highest-surplus supplier. In this situation, the buyer benefits from the efficiencies because she now receives the surplus offered by the original winner, who is now the runner-up. Thus, the utility received by the buyer increases in such a scenario. Unlike the previous cases, however, the change in price is not sufficient to characterize the change in utility, and in fact price could increase while utility also increases. We demonstrate this next.

29. We start by analyzing buyer utility. Before the merger, it is

$$u_{ij}(v,p) = v_{iz} - p_i^{pre} = \max_{k \neq z}\{w_{ik}\} \tag{10}$$

and after the merger, it is

$$u_{ij}(v,p) = v_{ij} - p_i^{post} = \max_{k \neq j}\{w_{ik}\} = w_{iz} \tag{11}$$

where the second equality in equation (11) follows from the fact that the previously highest surplus must necessarily become the second-highest surplus. Thus, the increase in buyer utility is given by the improvement in the second-best surplus

$$\Delta u_{ij} = w_{iz} - \max_{k \neq z}\{w_{ik}\} > 0 \tag{12}$$

30. The difference is smaller in absolute value than the change in costs resulting from efficiencies. If the merged supplier had the second-best surplus before the merger, then

$$\Delta u_{ij} = w_{iz} - w_{ij} = w_{iz} - (w_{ij}^{eff} - \Delta c_{ij}) = \Delta c_{ij} - (w_{ij}^{eff} - w_{iz}) < \Delta c_{ij} \tag{13}$$

where the last inequality follows because the surplus from j after the efficiencies is higher than the surplus from z. Similarly, if a non-merging supplier x is the second-best surplus instead of the merged supplier before the merger, then

$$\Delta u_{ij} = w_{iz} - w_{ix} < w_{ij}^{eff} - w_{ix} = \left(w_{ij} + w_{ix}\right) + \Delta c_{ij} < \Delta c_{ij} \quad (14)$$

where the last inequality follows because the surplus from j before the efficiencies is lower than the surplus from x.

31. While buyer utility unambiguously increases in this scenario, price may change in any direction. This is because while surplus increases, value may increase or decrease depending on differences in marginal cost. Thus, changes in price are not sufficient to measure changes in buyer utility when the good being traded changes.

2.4 Efficiencies do not increase buyer utility if the merged supplier had the highest surplus before the merger

32. Efficiencies in the SSA model do not change the auction's outcome—and thus do not benefit buyers—if the merged supplier had the highest surplus before the merger. In effect, competition is driven by the runner-up supplier, and thus the merged supplier's efficiencies do not affect its incentive to compete. Thus, while the outcome is more efficient in that more surplus is created through the reduction in the merged supplier's cost,[15] the transaction price is unaffected relative to a situation without efficiencies. This is an important implication of the SSA model and, more generally, of certain settings in which prices are set individually: competition for current customers of the merged supplier cannot increase and thus these customers do not benefit from efficiencies arising from the merger.[16]

2.5 Efficiencies do not increase buyer utility if the merged supplier was not the winner or the runner-up before and after the merger

33. Finally, efficiencies also do not change the outcomes in auctions in which the merged supplier finishes as third-highest surplus supplier or lower. In these auctions, buyers are not adversely affected by the merger or acquisition, nor do they benefit from efficiencies that arise from the merger.

2.6 Summary

34. Table 2 summarizes the impact of efficiencies on price and buyer utility.

Table 2. Impact of efficiencies on buyer utility and price, relative to mergers without efficiencies

	Change in Utility	Change in Price
Buyers who benefit from efficiencies		
Merged supplier is the runner-up before and after the merger	↑	↓
Merged supplier becomes the new runner-up after the merger	↑	↓
Merged supplier becomes the new winner after the merger	↑	?
Buyers who do not benefit from efficiencies		
Merged supplier is already the winner before the merger	N/A	N/A
Merged supplier is not the winner or the runner-up after the merger	N/A	N/A

3. Simulation of distributional consequences of efficiencies

35. We ran a simulation of 100,000 auctions to illustrate the distributional consequences of efficiencies in the SSA model. We consider the same scenario as before, where there are four identical suppliers A–D, each with a share of 25%, a margin of $50,000, and a price of $250,000. Supplier A and Supplier B merge and achieve efficiencies that lead to a 5% cost reduction of each merged supplier's cost equal to $10,000.

36. Under the assumption that surplus follows a Gumbel distribution, supplier-specific surplus can be decomposed such that $w_{ij} = \delta_j + \epsilon_{ij}$, where δ_j is a mean supplier-specific surplus and ϵ_{ij} are stochastic draws that are independent and identically distributed Type I extreme value. In order to simulate each auction, each supplier's mean supplier-specific surplus δ_j as calibrated to match the supplier's share. Then, to simulate each supplier's surplus stochastic draws were generated.[17] The winning supplier in each simulated auction is the supplier with the highest supplier-specific surplus. Post-merger, the merged supplier only submits its bid with the highest surplus and the merged supplier's surplus in each auction is recalculated by accounting for the cost reduction of $10,000. To the extent that the winner changes due to the change in the merged supplier's surplus, the winning supplier is updated. Finally, the average change in price and utility is calculated for each buyer type across the 100,000 simulated auctions.

15 OECD, Competition Policy and Efficiency Claims in Horizontal Agreements, OECD/GD(96) 65: "[T]he basic objective of competition policy is to protect and preserve competition as the most appropriate means of ensuring the efficient allocation of resources—and thus efficient market outcomes—in free market economies" (p. 5).

16 We do not address here whether this implication is a reasonable approximation to real-life competitive situations.

17 The Gumbel distribution in the simulation uses a scale parameter implied by a share of 25% and a margin of $50,000.

37. Table 3 shows the price effects by five buyer types discussed in Section II.2.[18] The table provides further insight into the breakdown of the incidence of the benefit arising from efficiencies to different types of buyers.

38. Consistent with Table 2, efficiencies benefit three buyer types. As shown in the first row of Table 3, in auctions in which the merged supplier is the runner-up before and after the merger, the price paid by the buyers decreases by 4.0%, and buyer utility increases by $10,000, representing a 100% pass-through rate of cost reduction to buyers in this group. The second row shows auctions in which the merged supplier becomes the runner-up after the merger. In these auctions, the price paid by the buyers decreases by 2.0%, while buyer utility increases by $5,051, representing a ~50% (5,051/10,000) pass-through rate of cost reduction to buyers in this group. The third row shows auctions in which the merged supplier becomes the winner after the merger. In these auctions, the price paid by the buyers decreases by 3.9%, while buyer utility increases by only $4,824, representing a ~48% (4,824/10,000) pass-through rate of cost reduction to buyers in this group. It is worth noting that although our simulation shows that the price paid by the buyers in this group decreases in this particular scenario, the price could have theoretically increased as well. Buyers in auctions in which the merged supplier is the runner-up before and after the merger benefit the most among the three buyer types. Moreover, while the average decrease in price in auctions for which the merged supplier becomes the winner is larger than the average decrease in price in auctions for which the merged supplier is the runner-up, the average change in utility for buyers in these auctions is lower.

39. The last column of Table 3 illustrates that incidence of efficiencies occurs mostly on auctions in which the merged supplier is the runner-up rather than on auctions in which the merged supplier is the winner. The three buyer types that benefit from efficiencies represent about 38% of all buyers. Among the buyers that benefit, 16% (6/38) of the buyers correspond to auctions in which the merged supplier becomes the new winner after the merger. The remaining 84% (32/38) of the buyers correspond to auctions in which the merged supplier is the runner-up after the merger.

40. Table 3 also shows that efficiencies do not benefit two buyer types. In particular, efficiencies do not benefit buyers if one of the merged suppliers offers the highest surplus prior to the merger, as shown in the fourth row of the table. In particular, the price paid by these buyers increases by 4.1%. For these buyers, the price increase is the same with or without efficiencies. Efficiencies also do not benefit buyers in auctions where the merged suppliers rank third or lower among all suppliers after the merger, as shown in the last row of the table. In these auctions, accounting for about 13% of all buyers, the price effects from efficiencies are zero because the merger does not affect the outcome in any way.

18 Price effects are calculated based on a simulation of 100,000 auctions.

Table 3. Effects of Efficiencies By Buyer

	Change in Utility	Percent Change in Price	Share of All Buyers
Buyers who benefit from efficiencies			
Merged supplier is the runner-up before and after the merger	10,000	– 4.0%	27.8%
Merged supplier becomes the new runner-up after the merger	5,051	– 2.0%	3.8%
Merged supplier becomes the new winner after the merger	4,824	– 3.9%	5.7%
Buyers who do not benefit from efficiencies			
Merged supplier is already the winner before the merger	– 10,280	4.1%	50.1%
Merged supplier is not the winner or the runner-up after the merger	0	0.0%	12.6%

III. Considerations for the efficiencies defense

41. The way in which efficiencies impact the distribution of price effects in the SSA model and similar settings with individual prices has important implications in the context of the efficiencies defense.[19] Traditionally in posted price settings, the efficiencies defense describes that efficiencies reduce costs and lower prices. This, in turn, increases the incentive of the merged parties to compete, and thereby increases competition. The SSA setting, however, does not allow for this same incentive mechanism: the merged supplier does not directly set prices and its incentives remain the same pre- and post-merger to submit their offer at marginal cost.[20] Therefore, in the SSA model, efficiencies increase competition by improving the surplus that can be achieved by certain auctions, and in particular increase the utility that certain groups of buyers are able to extract from suppliers in certain auctions. Below, we list two considerations for practitioners as they map the model's predictions to their legal and economic arguments.

19 L. Kaplow, Efficiencies in Merger Analysis, *Harvard Law School John M. Olin Center Discussion Paper* No. 1056, 2021, https://ssrn.com/abstract=3811790. *See also* Hovenkamp, *supra* note 3.

20 As Miller (2014), *supra* note 2, explains, predictions from the SSA model can be extended to other models of competition, for example to bargaining taking place in rounds. The common element is that the seller does not post a price, but that the price is the outcome of competing offers. The intuition from our discussion of the SSA model may be extended to these other models.

1. Efficiencies predominantly benefit buyers that are not harmed by the reduction in competition from the merger

42. The scope of the efficiencies defense in certain jurisdictions may be interpreted as being limited to situations in which efficiencies offset adverse price effects of the merger or acquisition. For example, the Horizontal Merger Guidelines state that "[i]*n a unilateral effects context, incremental cost reductions may reduce or reverse any increases in the merged firm's incentive to elevate price*."[21] However, the simulation above illustrates that, in the context of the SSA model, efficiencies predominantly affect buyers who do not transact with the merged supplier and therefore are not affected by any unilateral adverse price effects arising from the transaction. Conversely, buyers who could be impacted by the transaction's price effects do not benefit from efficiencies unless they are newly acquired customers post-merger. Furthermore, while these newly acquired customers experience an increase in utility due to efficiencies, they may or may not experience an actual price decrease, as shown in Section II.2.3.

2. Changes in prices alone are not an appropriate measure of changes in competition when products differ across suppliers

43. An important feature of the SSA model is that suppliers offer products with heterogeneous value to the buyers, who as a result care about non-price aspects of the product. While the potential reduction in competition from a merger does not change the product that is sold and can be seen directly in increased prices, the effects of increased competition from efficiencies may be seen both in reduced prices and in changes in the winning supplier. When the supplier changes, the value of that supplier's good may be higher or lower than the previous supplier, and the price may be higher or lower than the previous price, as demonstrated in Section II.2.3. All that can be said with certainty is that the difference between value and price has increased. As a result, and consistent with the HMG, any assessment of merger outcomes should be based on the change in consumer utility rather than in prices alone.[22]

IV. Conclusion

44. This article describes how to implement efficiencies in the context of the SSA and highlights two ways in which the SSA differs from models with posted prices. First, while an analysis of efficiencies in settings with posted prices focuses on parties' own incentives to change their own posted prices, in settings where prices are set on an individual basis, such as SSAs, efficiencies may disproportionately impact the pricing of products sold by non-merging parties. Second, efficiencies may increase a buyer's welfare while also increasing the price paid by a buyer for the good or service at issue. ■

21 HMG, § 10.

22 Ibid. ("Similarly, purported efficiency claims based on lower prices can be undermined if they rest on reductions in product quality or variety that customers value.")

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